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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/737,642	12/14/2000	Daniel C. Wang	ACT-311	2280

7590

09/09/2003

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EXAMINER

DIAZ, JOSE R

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 09/09/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/737,642

Applicant(s)

WANG, DANIEL C.

Examiner

José R Díaz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

3. Claims 1 and 10 recite the new limitations of “ a metal layer disposed under and in physical contact with said Cu metal layer” and “forming a metal layer under and in physical contact with a lower Cu metal layer”, respectively. However, nowhere in the specification applicant describes such limitations in which the metal layer is in direct or physical contact with the Cu metal. As a matter of fact, the specification only supports the limitation of forming a Cu metal layer electrically connected to the metal layer (see page 6, lines 3-5 and page 8, lines 5-7).

4. Claims 2-9 are rejected due to their dependency on claim 1.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. As far as understood, claims 1, 3, 5 and 10 are still rejected under 35 U.S.C. 102(e) as being anticipated by Shao et al. (US Pat. No. 6,124,194).

Regarding claims 1 and 10, Shao et al. teach an antifuse (see cols. 1-6) comprising: a lower insulating layer (20); a lower Cu metal layer (26); a metal layer (12) disposed under and electrically connected to said lower Cu metal layer; a lower barrier layer (36); an antifuse material layer (38); an upper barrier layer (40, 44); an upper insulating layer (46); and an upper Cu metal layer (56) (see Fig. 4).

Regarding claim 3, Shao et al. further teaches that the antifuse material (38) comprises amorphous silicon (see col. 3, lines 16-20).

Regarding claim 5, Shao et al. further teaches that the upper barrier layer (44) comprises TiN (see col. 3, lines 16-20).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 2, 4 and 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shao et al. (US Pat. No. 6,124,194) in view of Yeouchung et al. (US Pat. No. 6,001,693).

Regarding claim 2, Shao et al. teaches that the antifuse further comprises first and second cap layers (28) (see Fig. 4 and col. 3, lines 1-5, wherein Shao et al. discloses that the layer 28 may comprises one, two or three layers). However, Shao et al. fails to teach that the second cap layer envelopes the antifuse material and the upper barrier layer. Yeouchung et al. teach that is well known in the art to envelope the antifuse material (22) and the upper barrier layer (24) with a cap layer (40, 42) (see Fig. 10 and col. 3, lines 17-23). Shao et al. and Yeouchung et al. are analogous art because they are from the same field of endeavor as applicant's invention. At the time of the invention it would have been obvious to a person of ordinary skill in the art to envelope the antifuse material and the upper barrier layer with the second cap layer. The motivation for doing so, as is taught by Yeouchung et al., is reducing side diffusion associated with the top electrode or upper metal layer (col. 3, lines 18-20). Therefore, it would have been obvious to combine Shao et al. with Yeouchung et al. to obtain the invention of claims 2, 4, and 6-9.

Regarding claim 4, Shao et al. further teaches that the lower barrier layer (36) comprises Ta N (see col. 3, lines 16-20) encladded in the first clap layer (28) (See Fig. 4).

Regarding claim 6, Shao et al. teaches that the first cap layer (28) comprises nitride (see col. 3, lines 3-4). In addition, Yeouchung et al. teaches that the second cap layer (40, 42) comprises nitride (see col. 3, lines 21-22).

Regarding claim 7, Shao et al. teaches that the antifuse material (38) comprises amorphous silicon (see col. 3, lines 16-20).

Regarding claim 8, Shao et al. further teaches that the lower barrier layer (36) comprises Ta N (see col. 3, lines 16-20).

Regarding claim 9, Shao et al. further teaches that the upper barrier layer (40, 44) comprises TiN (see col. 3, lines 16-20).

Response to Arguments

9. Applicant's arguments filed June 26, 2003 have been fully considered but they are not persuasive. As stated before, the new limitation incorporated in the claims is not supported by the specification. As a matter of fact, the specification only provides support for a structure in which the Cu layer is electrically connected to the lower metal layer (see page 6, lines 3-5 and page 8, lines 5-7). Shao et al. clearly teaches such structural limitation in figure 4, in which the Cu layer (26) is electrically connected to the lower metal layer (12) via the barrier layer (24). Therefore, the rejection is considered to be proper since Shao et al. discloses the limitation.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

11. A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Correspondence

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to José R Díaz whose telephone number is (703) 308-6078. The examiner can normally be reached on 9:00-5:00 Monday, Tuesday, Thursday and Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703) 308-1690. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JRD


GEORGE ECKERT
PRIMARY EXAMINER